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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/928,860	08/13/2001	Peter C. Van Buskirk	ATMI-0357-DIV	8391

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EXAMINER	
FULLER, ERIC B	

ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 05/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/928,860	VAN BUSKIRK ET AL.
	Examiner	Art Unit
	Eric B Fuller	1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 March 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *38-60,62 and 64-69* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *38-60,62 and 64-69* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 38-42, 50, 51, 53-55, 57-60, 62-63, and 65-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Satoh et al. (US 5,757,061) in view of Roeder et al. (TI, Defense Systems & Electronics Group) and Miller (US 3,805,195).

Satoh teaches a ferroelectric PZT material having a dimensionally scalable character (column 8, lines 33-46; column 9, lines 35-40; column 11, lines 9-21), a P_{sw} greater than 20 $\mu C/cm^2$ (column 1, lines 67), a leakage current density less than 10^{-5} A/cm^2 (fig. 5; column 10, lines 6-10; column 11, lines 9-21), and an E_c property (column 3, line 22; column 9, line 57; column 11, lines 9-21). Satoh also teaches a FeRAM device including a stack capacitor (Fig. 1) comprising the ferroelectric PZT material having a capacitor area of 100 μm^2 (column 9, lines 35-40) and thickness of 100 nm (column 8, line 37) on a Pt electrode. The PZT material is deposited by means of a MOCVD method (abstract). The reference is silent to using liquid delivery MOCVD.

However, Roeder teaches a method of liquid delivery MOCVD that is capable of depositing PZT layers that have the same P_{sw} as Satoh (abstract). Therefore, it would

have been obvious at the time the invention was made to a person having ordinary skill in the art to use the liquid delivery MOCVD method, and the corresponding precursors (experiment), in the process taught by Satoh. By doing so, one would have a reasonable expectation of success, as Satoh teaches to use a MOCVD method and Roeder teaches a MOCVD method that is capable of achieving the same constraints on the deposited material. Additionally, Roeder teaches plateau effect distribution (page 3, last paragraph, to page 6) in order to determine the user variables that optimize the properties and deposition of the PZT material. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use plateau effect distribution to determine the user variables in the process taught by Satoh. By doing so, the properties and deposition of the PZT material are optimized. Roeder teaches using remanent polarization in the plateau effect distribution and is silent in teaching using ferroelectric polarization.

However, Miller teaches that ferroelectric polarization is a function that is dependant on the remanent polarization (column 1, lines 60-67). From this, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use ferroelectric polarization in the plateau effect distribution taught by Roeder. By doing so, one would have a reasonable expectation of achieving similar results, as Miller teaches the art recognized suitability of expressing ferroelectric polarization in terms of remanent polarization or vice-versa.

Claims 43-49 rejected under 35 U.S.C. 103(a) as being unpatentable over Satoh et al. (US 5,757,061) in view of Roeder et al. (TI, Defense Systems & Electronics Group) and Miller (US 3,805,195), as applied to claim 38 above, and further in view of Baum et al. (US 5,916,359).

Satoh, in view of Roeder and Miller, teaches the limitations of claim 38, but fails to explicitly teach all the claimed precursors and is silent to the identity of the solvent. However, Baum teaches suitable precursors and solvents for liquid delivery MOCVD of ferroelectric layers in column 3, lines 40-50 and the examples. To use these precursors and/or solvents in the process taught by Satoh in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would have a reasonable expectation of success, as both reference are concerned with depositing ferroelectric layers by liquid delivery MOCVD.

Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Satoh et al. (US 5,757,061) in view of Roeder et al. (TI, Defense Systems & Electronics Group) and Miller (US 3,805,195), as applied to claim 38 above, and further in view of Visokay et al. (US 6,211,034 B1).

Satoh, in view of Roeder and Miller, teaches the limitations of claim 38, but fails to explicitly teach the barrier layer. However, Visokay teaches a barrier layer made of TiAlN for limiting diffusion of the ferroelectric material in the substrate (column 2, lines 5-15). The reference also teaches that iridium is useful as an adhesion layer (column 7, lines 5-18). To use the barrier layer and adhesion layer taught by Visokay in the

process of Satoh in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would prevent diffusion and increase adhesion of the PZT layer.

Claim 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over Satoh et al. (US 5,757,061) in view of Roeder et al. (TI, Defense Systems & Electronics Group) and Miller (US 3,805,195), as applied to claim 38 above, and further in view of Kim et al. (US 6,229,166 B1).

Satoh, in view of Roeder, and Miller teaches the limitations of claim 38, but fails to explicitly teach the nucleation layer. However, Kim teaches that a nucleation layer reduces that non-desirable imprint phenomenon (column 1, lines 60-68; column 2, lines 19-49). To use the nucleation layer taught by Kim in the process of Satoh in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would prevent the imprint phenomenon.

Claims 38-42, 50, 51, 53-55, 57-60, 62-63, and 65-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (US 6,309,894 B1) in view of Roeder et al. (TI, Defense Systems & Electronics Group) and Miller (US 3,805,195).

Miki teaches a ferroelectric PZT material having an E-field scalable character (column 4, line 47; column 8, line 59; column 9, lines 34-40), a P_{sw} greater than 20 $\mu C/cm^2$ (column 9, line 63 – column 10, line 2), and a leakage current density less than

10^{-5} A/cm^2 (column 8, lines 63-67). Miki also teaches a FeRAM device including a stack capacitor comprising the ferroelectric PZT material having a thickness of 100 nm (column 8, line 59) on a Pt electrode. The reference is silent to using liquid delivery MOCVD as the deposition means.

However, Roeder teaches a method of liquid delivery MOCVD that is capable of depositing PZT layers that have the same P_{sw} as Miki (abstract). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the liquid delivery MOCVD method, and the corresponding precursors (experiment), in the process taught by Miki. By doing so, one would have a reasonable expectation of success, as Roeder teaches a deposition method that is capable of achieving the same constraints on the deposited material. Additionally, Roeder teaches plateau effect distribution (page 3, last paragraph, to page 6) in order to optimize that properties and deposition of the PZT material. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to use plateau effect distribution in the deposition method. By doing so, the properties and deposition of the PZT material are optimized. Roeder teaches using remanent polarization in the plateau effect distribution and is silent in teaching using ferroelectric polarization.

However, Miller teaches that ferroelectric polarization is a function that is dependant on the remanent polarization (column 1, lines 60-67). From this, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use ferroelectric polarization in the plateau effect distribution taught by

Roeder. By doing so, one would have a reasonable expectation of achieving similar results, as Miller teaches the art recognized suitability of expressing ferroelectric polarization in terms of remanent polarization or vice-versa.

Claims 43-49 rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (US 6,309,894 B1) in view of Roeder et al. (TI, Defense Systems & Electronics Group) and Miller (US 3,805,195), as applied to claim 38 above, and further in view of Baum et al. (US 5,916,359).

Miki, in view of Roeder and Miller, teaches the limitations of claim 38, but fails to explicitly teach all the claimed precursors and is silent to the identity of the solvent. However, Baum teaches suitable precursors and solvents for liquid delivery MOCVD of ferroelectric layers in column 3, lines 40-50 and the examples. To use these precursors and/or solvents in the process taught by Miki in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would have a reasonable expectation of success, as both reference are concerned with depositing ferroelectric layers by liquid delivery MOCVD.

Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (US 6,309,894 B1) in view of Roeder et al. (TI, Defense Systems & Electronics Group) and Miller (US 3,805,195), as applied to claim 38 above, and further in view of Visokay et al. (US 6,211,034 B1).

Miki, in view of Roeder and Miller, teaches the limitations of claim 38, but fails to explicitly teach the barrier layer. However, Visokay teaches a barrier layer made of TiAlN for limiting diffusion of the ferroelectric material in the substrate (column 2, lines 5-15). The reference also teaches that iridium is useful as an adhesion layer (column 7, lines 5-18). To use the barrier layer and adhesion layer taught by Visokay in the process of Miki in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would prevent diffusion and increase adhesion of the PZT layer.

Claim 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miki et al. (US 6,309,894 B1) in view of Roeder et al. (TI, Defense Systems & Electronics Group) and Miller (US 3,805,195), as applied to claim 38 above, and further in view of Kim et al. (US 6,229,166 B1).

Miki, in view of Roeder and Miller, teaches the limitations of claim 38, but fails to explicitly teach the nucleation layer. However, Kim teaches that a nucleation layer reduces that non-desirable imprint phenomenon (column 1, lines 60-68; column 2, lines 19-49). To use the nucleation layer taught by Kim in the process of Miki in view of Roeder would have been obvious at the time the invention was made to a person having ordinary skill in the art. By doing so, one would prevent the imprint phenomenon.

Claim 69 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roeder et al. (TI, Defense Systems & Electronics Group) in view of Miller (US 3,805,195).

Roeder teaches a method of liquid delivery MOCVD for depositing a layer (abstract). Roeder teaches plateau effect distribution (page 3, last paragraph, to page 6) in order to determine the user variables that optimize the properties and deposition of the PZT material. Roeder teaches using remanent polarization in the plateau effect distribution and is silent in teaching using ferroelectric polarization.

However, Miller teaches that ferroelectric polarization is a function that is dependant on the remanent polarization (column 1, lines 60-67). From this, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use ferroelectric polarization in the plateau effect distribution taught by Roeder. By doing so, one would have a reasonable expectation of achieving similar results, as Miller teaches the art recognized suitability of expressing ferroelectric polarization in terms of remanent polarization or vice-versa.

Response to Arguments

Applicant argues that Roeder fails to teach ferroelectric polarization in the plateau effect distribution, as has been added by amendment. Examiner agrees and has withdrawn the rejections of the previous action accordingly. Examiner has provided Miller to make up for the deficiencies of the previous rejection. Applicant's arguments are moot in view of the new grounds of rejection.

Applicant argues that Roeder fails to explicitly teach determining temperature and pressure by the plateau effect distribution process taught by Roeder. This argument is not found convincing. Roeder teaches to determine the user-determined variables by the plateau effect distribution. Temperature and pressure, as taught by Satoh and/or Miki, are user-determined variables. From this, one of ordinary skill in the art would recognize that, by the combination of the references, pressure and temperature should be determined by the plateau effect distribution method, as they are user-determined variables.

Conclusion

Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B Fuller whose telephone number is (571) 272-1420. The examiner can normally be reached on Mondays through Thursdays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P Beck, can be reached at (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

EBF

TIMOTHY MEEKS
PRIMARY EXAMINER